A Survey of Trumpeter Swans and their Habitat in Southern Mackenzie District, Northwest Territories

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A SURVEY OF TRUMPETER SWANS AND THEIR HABITAT

IN SOUTHERN MACKENZIE DISTRICT, NORTHWEST TERRITORIES

Habitat Management Section

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Kevin J. McCormick

and

Len J. Shandruk

Canadian Wildlife Service

Western and Northern Region

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ABSTRACT

A survey of trumpeter swans and their habitat was conducted from 05-08 August, 1985. Objectives of the study were: 1) to determine the location and extent of actual or potential trumpeter swan habitat in the southern Mackenzie District, NWT, and 2) to determine the distribution and abundance of trumpeter swans in the southern Mackenzie District.

The survey was flown in a Cessna 185 airplane at an approximate speed of 225 kph. Flight level (approximately 150 metres agl) and speed were reduced, when necessary, for inspection of birds and their habitat. Two observers were present in addition to the pilot.

Fifty-one adult swans, including 17 pairs were observed. Twenty-four young, in seven broods were also noted. The total number of adult swans observed represents approximately 13% of the total Canadian population. The majority of the swans were concentrated in the Nahanni Butte area and in the vicinity of Carlson Lake. Additional field work to confirm the distribution and total population of trumpeter swans in the region and to collar a number of individuals is recommended.

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1.0 INTRODUCTION

1.1 Distribution and Abundance

Scattered flocks of breeding trumpeter swans (Cygnus buccinator) occur in Alaska (King and Conant 1981); Yukon (McKelvey et al. 1983); British Columbia and Alberta (Brechtel 1982); Saskatchewan (Nieman and Isbister 1974); Montana, Idaho, and Wyoming (Palmer 1976). Geographically, trumpeter swans comprise the Pacific Coast and Rocky Mountain populations as illustrated in Fig. 1 (Anon. 1984).

The Pacific Coast population breeds in interior and south-central Alaska and winters primarily along the coasts of southern Alaska, British Columbia, Washington, and Oregon. Approximately 600-1000 birds winter in the central interior of British Columbia where open water occurs. Some breeding birds from Yukon may also winter in central British Columbia (B. Turner, CWS, pers. comm.).

The Rocky Mountain population is comprised of a non-migratory "Tri-state" (Montana, Idaho, and Wyoming) subpopulation and a migratory "Interior" subpopulation. Both subpopulations winter in the same area - the headwaters of the Snake River in Idaho and the Yellowstone River in Wyoming. The Interior subpopulation includes a flock that nests in the Peace River area of Alberta and British Columbia and another flock that nests in the Toobally Lakes area of southern Yukon.

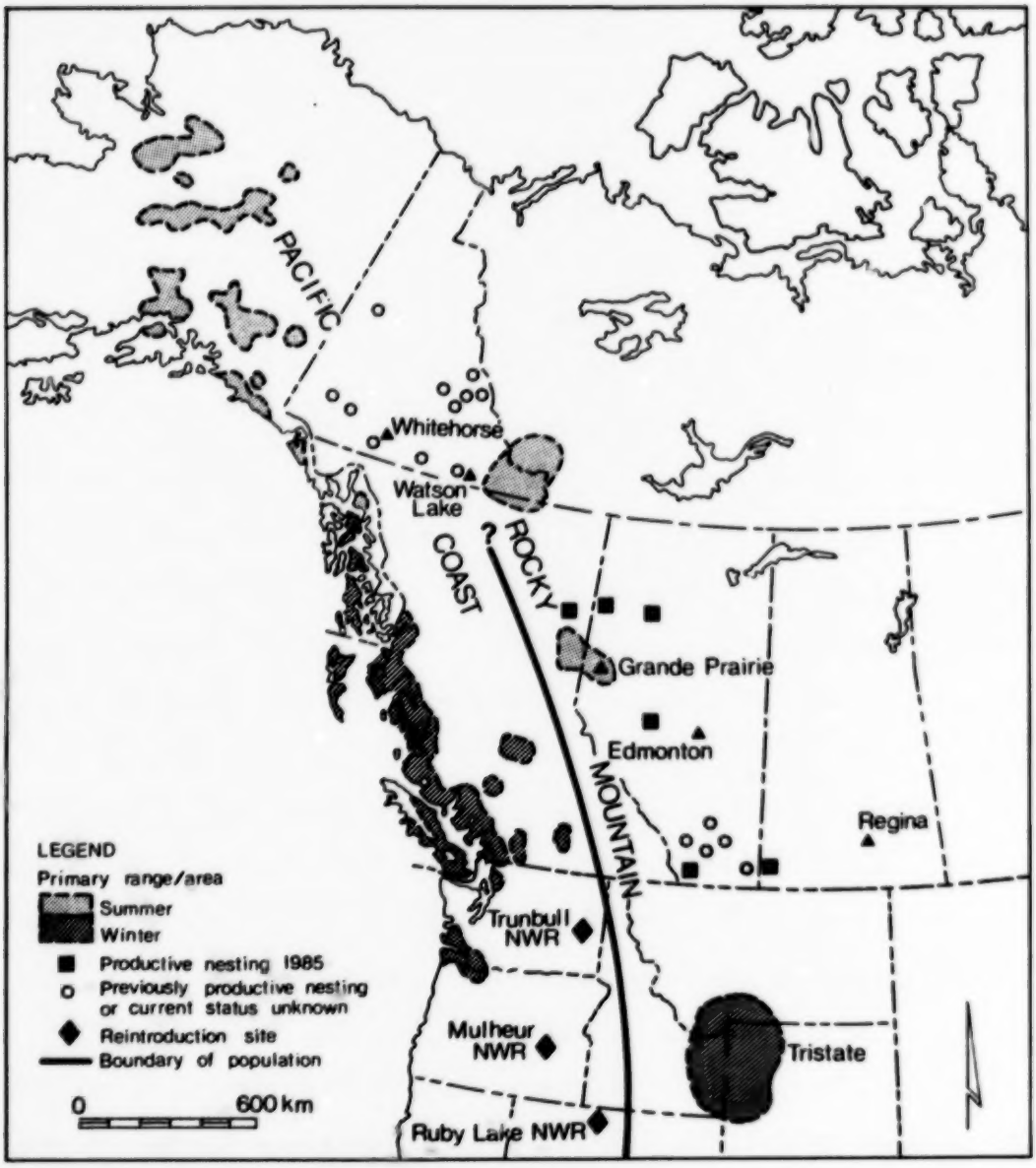

Figure 1. Distribution of Pacific Coast and Rocky Mountain populations of trumpeter swans in North America.

Additional breeding pairs, to the west of the Toobally Lakes, could belong to either the Pacific Coast or the Rocky Mountain populations.

Although the North American population is approximately 10,000 birds (Anon. 1984) it is considered a rare breeding bird in Canada (MacKay 1978). Pre-1985 breeding population estimates are: about 50 pairs in southern Yukon, 61 pairs in west central Alberta, several small pioneer flocks (13 pairs) in other parts of Alberta, 10 pairs in northern British Columbia, and one pair in southwestern Saskatchewan. A few pairs have also been observed in the southwest portion of Northwest Territories (McCormick 1985).

1.2 Breeding Habitat

Several factors which influence the suitability of an area as breeding habitat are:

Open Water: As swan cygnets require 100-120 days to fledge (Banko 1960, Hansen et al. 1971), waterbodies must remain open long enough to allow the young swans to attain flight. Accordingly, 64°N is the theoretical northern limit for breeding trumpeter swans (Hansen et al. 1971).

Nest Sites: Most swans nest in emergent vegetation (Banko 1960, Hansen et al. 1971, Holton 1982). Nests are often surrounded by a "moat" of open water. Most nest sites in the Grande Prairie, Alberta region were located at least 40 m from shore (Holton 1982). However, alternate nest sites such as

abandoned beaver houses, small islands, and shorelines have been noted by Hansen et al. (1971) and McKelvey et al. (1983). The islands were utilized on waterbodies with timbered shorelines where there was little emergent vegetation.

Foraging Sites: As swans generally forage by "tipping up", the food available within approximately 100 cm of the water surface is a critical factor (Holton 1982). Important food sources in the breeding areas of Alaska, Yukon, and Alberta are listed in McCormick (1985).

Disturbance: Human activity may increase the rate of avian nest desertion (Rean 1976, Ellison and Cleary 1978), the susceptibility of eggs to natural predation (MacInnes et al. 1974, Rean 1976) or the removal of eggs (Beer and Ogilvie 1972). Hansen et al. (1971) reported lower survival of cygnets in areas subjected to human disturbance. This was attributed to the movement of cygnets (and adults) from their natal marshes. Repeated human disturbances may inhibit reproductive attempts (Page 1976, Shea 1979). As an example, few nest sites in the Grande Prairie area are within 200 m of shorelines where agricultural activity occurs (Holton 1982).

Most of the above factors are under the direct influence of the prevailing water levels. Not surprisingly, many nests in Yukon are associated with beaver activity which often stabilizes pond water levels (McKelvey et al. 1983).

1.3 Key Habitat Sites

The Canadian Wildlife Service (CWS) has recently completed a compilation (McCormick et al. 1984) of the key migratory bird terrestrial habitat sites in the Northwest Territories (NWT). Any site which supports at least one percent of the Canadian population of a migratory bird species or subspecies, for any portion of the year, is considered to be a key habitat site. Evaluations are based upon the best available estimates of national and regional populations and the number of individuals present at each site. Some of the site-specific data are of variable quality and recency. Sites, therefore, have been ranked with regard to updating the appropriate information and will be systematically surveyed as financial and personnel resources permit.

Trumpeter swan breeding habits in Mackenzie District are priority sites for the following reasons:

1) the trumpeter swan is a rare bird in Canada (COSEWIC) (MacKay 1978).
2) the theoretical northern limit of trumpeter swan breeding habitat is 64°N (Hansen et al. 1971). From available information (air photos, topographic maps), there appears to be considerable suitable but scattered habitat in this region.
3) a 1984 survey (McCormick 1985) revealed several previously unoccupied sites and two new nest sites.

4) casual observations have been reported from Netla River (60°56'N, 123°18'W) (B. Kozachenko, Parks Canada, pers. comm.), Camsell Bend (62°17'N, 123°22'W) (K. Davidge, GNWT Renewable Resources, pers. comm.), and along the North Nahanni River (E. Neil, pers. comm.).

5) there is a disparity of approximately 700 birds between the autumn production estimates and the higher winter counts of the Rocky Mountain population (R. Gale Idaho Fish and Game Dept. pers. comm.).

6) a survey of swans in the NWT is a top priority under the North American Trumpeter Swan Management Plan (Anon. 1984).

7) trumpeter swan breeding sites are potential "Key Terrestrial Habitat Sites" (McCormick et al. 1984).

1.4 Objectives

The objectives of this study were:

1) to determine the location and extent of actual or potential trumpeter swan habitats in the southern Mackenzie District.

2) to determine the distribution and abundance of trumpeter swans in the southern Mackenzie District.

2.0 STUDY AREA

The study area includes that portion of the Mackenzie District which lies west of the Mackenzie River and south of 64°N (Fig. 2). The western and southern limits are the Yukon and British Columbia boundaries, respectively. Nahanni National Park Reserve is situated in the southern portion of the study area. Communities within the study area include: Wrigley, Fort Simpson, Jean Marie River, Fort Liard, Nahanni Butte, and Tungsten.

2.1 Physiography

The study area includes both the Cordilleran (Mackenzie Mountain Area) and Interior Plains physiographic regions. The Mackenzie Mountain Area is represented by the Mackenzie Mountains, the Mackenzie Plain, and the Liard Plateau divisions whereas the Interior Plains includes the Great Slave Plain, the Alberta Plateau, and the Fort Nelson Lowland divisions (Bostock 1967).

The Mackenzie Mountains comprise several diverse physiographic elements that impact a pronounced north-south grain to the country (Douglas and Norris 1960). The interior is a sea of peaks and ridges reaching to 2600 m whereas the more easterly ranges are lower and divided by wide valleys, or cut by deep canyons. The timberline is low and the mountains present an aspect of bare, rock-covered slopes with few cliffs (Bostock 1970).

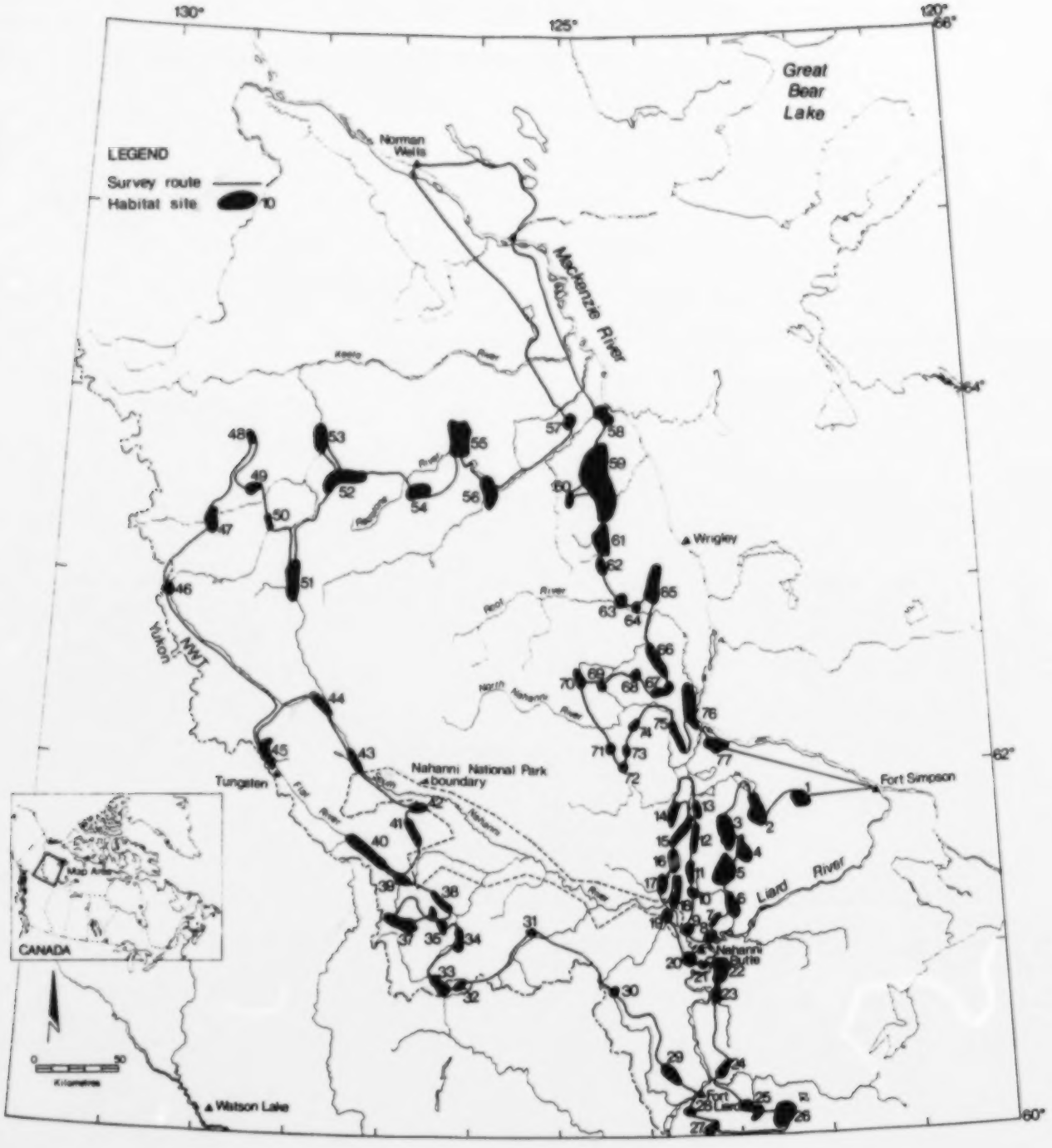

Figure 2. Location of the study area within Northwest Territories.

The Mackenzie Plain is a broad (50-90 km), rolling drift and tree-covered plain lying between the Mackenzie and Franklin mountains. The plain is an area of mainly low elevation and relief through which the Mackenzie River is entrenched for much of its course.

The Liard Plateau, between the South Nahanni and Liard rivers, is a region of tree and tundra-covered hills. Most of the summits which are less than 1375 m, are flat but extensive remnants of former erosion surfaces are evident. The valleys are narrow and deeply incised.

The Great Slave Plain lies east of the Franklin Mountains and north of approximately 61°N. The low-lying, near-flat terrain is covered by muskeg and numerous small, shallow lakes. Most of the region lies below 300 m elevation, however, three flat upland areas occur north of the Liard River. The highest, known as Martin Hills, attains an elevation of approximately 690 m elevation.

The Alberta Plateau in the southeast is composed of Cretaceous sediments and consists of a ring of plateaux (Cameron Hills and Caribou Mountains) separated by wide valleys. These hills form a disconnected escarpment with summits between 770 and 985 m elevation overlooking Great Slave Plain. A smooth upland surface is the main feature of the hills.

The Fort Nelson Lowland lies south of the Alberta Plateau and east of the Liard Plateau. It is one of the main valleys that occupy the Alberta Plateau. The rivers and their main

tributaries are more or less entrenched into the valleys which rise from less than 300 m in the north and northeast to about 770 m elevation in the west.

2.2 Geology

The Cordilleran region is largely composed of sedimentary rocks, particularly shales, siltstones, sandstones, limestones, and dolomites (Gabrielse et al. 1973). Most of the surficial materials were derived locally from the weathering of bedrock and were transported relatively short distances by glaciers, gravity or running water. Fast-flowing creeks, prone to flash floods, have deposited gravel and rock rubble along their channels whereas well-sorted sand and gravel occur in the beds of rivers and larger creeks. Fine-grained sand mixed with organic debris occur on the floodplains of the larger rivers, along with locally-occurring gravel bars. Sites of ancient glacial lakes also occur in some river valleys (Gabrielse et al. 1973).

The Interior Plains region is generally covered by a mantle of glacial till occurring as ground moraine with low rolling relief. Exposures of bedrock are relatively rare except along some of the principal rivers. Silt-clay plains, originating from glacial lake deposits, border many of the larger rivers. These areas are commonly covered by a mantle of sand and silty sand. Riverine deposits include silt, sand, peat, and

gravel which occur in river channels, floodplains, and low terraces adjoining the rivers and alluvial fans. Organic terrain occurs in wet areas where there is no organized drainage and water remains on the ground surface throughout the summer months.

2.3 Climate

The area experiences a continental climate with short warm summers and long cold winters. The growing season is short and never free from the danger of frost. Climatic data are not available for much of the study area, however, certain inferences may be drawn from existing meteorological stations (Table 1).

Although summer temperatures and the frost-free period decrease significantly with increasing latitude and particularly with increasing altitude, the pattern of rainfall is somewhat different. Tungsten receives the greatest rainfall of any station. Fort Simpson, however, receives less rainfall than other locales, perhaps because it is farther away from the mountains.

Such general observations must be considered in light of the limited number of meteorological stations. The diverse and complex topography of the area will obviously result in numerous localized climates which deviate markedly from the above-generalized patterns.

Table 1. Climatic data from stations in southern Mackenzie District, NWT (1951-1980)[1].

Community	Elev.(m)	May		June		July		August		September		Frost-Free Period (Days)
		T[2]	R[3]	T	R	T	R	T	R	T	R	
Wrigley	156	7.3	21.8	14.0	43.4	16.0	54.3	13.8	46.0	6.6	27.2	70
Tungsten	1143	2.1	19.2	9.0	68.4	10.9	90.9	9.5	72.3	3.3	55.7	42
Fort Simpson	169	7.9	20.4	14.4	32.0	16.6	51.2	14.4	36.9	7.3	23.1	79
Fort Liard	213	8.7	33.0	14.3	55.1	16.7	109.8	15.0	55.3	9.2	49.9	115

1 From: Atmos. Env. Serv. 1982a, b, c.

2 Mean Temperature (^{o}C).

3 Mean Rainfall (mm).

2.4 Vegetation

The montane vegetation is characterized by an altitudinal transition from the relatively dense forests of the lowlands to the alpine tundra on the mountains (Scotter et al. 1971). In the Flat-South Nahanni rivers area, the treeline occurs at approximately 1200 m on south and west-facing slopes and at 1100 m on the north and east-facing slopes. The treeline becomes lower with increasing latitude.

In valley bottoms, especially on floodplains, white spruce (Picea glauca) and balsam poplar (Populus balsamifera) occur whereas the shrub layer consists of alder (Alnus incana), squashberry (Viburnum edule), and wild rose (Rosa acicularis).

At higher altitudes and on north-facing slopes, black spruce (Picea mariana) becomes prominent, mixed with white spruce, lodgepole pine (Pinus contorta) or jackpine (P. banksiana). Alder (Alnus spp.) and labrador tea (Ledum groenlandicum) comprise the shrub layer.

At higher levels the forest grades into open black spruce and reindeer lichen and then into alpine tundra which is characterized by mountain avens (Dryas spp.), ericaceous shrubs, sedges, and grasses.

The Interior Plains vegetation is characterized as follows (Anon. 1974):

Recent alluvial soils support forests of white spruce, balsam, poplar and aspen in mixed or pure stands. The shrub layer consists of alder, willow, roses, and Viburnum spp.

Older alluvial soils are characterized by black spruce and white spruce in pure or mixed stands. White birch and poplar may form a minor component. Labrador tea and Vaccinium spp. comprise the shrub layer whereas sphagnum and feather mosses cover the ground.

Moderately drained glacial tills or lacustrine deposits support white spruce in pure stands or in association with black spruce, aspen, balsam poplar, and white birch. Willows, alders, dwarf birch, and Rosa acicularis are present in sparse to moderate quantities. Equisetum sp. and Pyrola sp. are the most common herbaceous species.

Well-drained upland sites support jack pine in pure stands or in association with aspen, white birch, and spruce. Sparse to moderate growth of Rosa acicularis, Linnaea borealis, and various species of Vaccinium are common. Mosses are usually absent in pure hardwood stands but increase with coniferous content.

Upland sites which support black spruce and sphagnum or lichen represent the transition from forest to tundra. Larch may also occur in limited amounts. Dwarf birch, alder and willow form the sparse upper shrub layer, whereas Labrador tea, Vaccinium spp., Potentilla fruticosa, Rubus chamaemoms and roses comprise the low shrub layer. Sphagnum, feather mosses, and lichens cover the ground.

3.0 METHODS

Potential swan breeding sites (Fig. 2) were identified on the basis of past observations (McCormick 1985), discussions with individuals who are familiar with the region, and physical features (see Section 1.2) which could be interpreted from topographical maps, air photos, and available literature. The sites were highlighted on 1:250,000 topographical maps and an appropriate survey route was determined. The sites were surveyed between 05-08 August when the cygnets are easily observed. As most cygnets, at this date, would likely survive to fall migration, an indication of production was also obtained.

The survey was flown in a Cessna 185 airplane, at approximately 150 m agl and about 225 km/h. Two observers accompanied the pilot. All waterbodies within sight of the survey route were examined. Upon sighting one or more swans, flight altitude and speed were reduced to determine: 1) number of adults present, 2) breeding status of the birds, and 3) number of cygnets present. Habitat information was also recorded. Habitat quality was subjectively rated on the basis of physical and vegetative features of the wetlands (Appendix 2). Observations were also recorded on: wetland type, submergent vegetation, emergent vegetation, width of emergent vegetation, and water turbidity. Photographs were taken of many of the wetlands to aid in their evaluation and for future reference.

4.0 RESULTS AND DISCUSSION

A total of 51 adults and 24 cygnets were recorded (Table 2). This adult total included 17 pairs, two groups of four birds, a group of three birds, and six lone birds. The seven broods averaged 3.4 (range: 2-5) cygnets each.

The majority of birds were concentrated in the area of the South Nahanni and Liard river junction and in the North Nahanni River-Carlson River area. The remaining birds were scattered throughout montane areas, particularly along the South Nahanni River.

4.1 Swan Habitats

Trumpeter swans were observed in the following locations:

Area 7: Although no birds were observed in this area during our survey, a pair of swans was seen here on 26 June, 1985 (Heap 1985). The habitat consists of a lake and a pond complex. The sedge-rush emergent zone around the lake is extensive and exceeds 40 m along most of the shoreline.

Area 8: A pair of swans were observed in this area in early July (C. Ingraham, pers. comm.), but were not present during this survey. A creek flowing through muskeg with several oxbow lakes is the predominent habitat type. The emergent zone is dominated by sedges and willows and is relatively narrow (<40 m). Overall, this site was rated fair swan habitat.

Area 9: Two adults and a pair of cygnets were observed in this area which consists of several ponds in an extensive

Table 2. Observations of trumpeter swans in southern Mackenzie District, August 1985.

Area No.	Wetland Type*	Map No.	UTM Location	Habitat Rating**	Swans Observed A	B	C	=D***
9	3,6	95G	DC 690 755	good	1	2	-	=4
14	2,6	95G	DD 645 465	good	1	-	-	=2
18	2,6	95G	DD 660 040	good	1	-	-	=2
18	2,6	95G	DC 650 995	good	1	5	-	=7
18	2,6	95B	DC 625 960	good	1	-	-	=2
19	1	95G	DC 580 860	fair	1	3	-	=5
20	1,6	95B	DC 660 610	good	-	-	4	=4
20	1,6	95B	DC 655 570	good	1	4	-	=6
21	2,3	95B	DC 805 540	good	1	3	-	=5
22	2,3	95B	DC 875 515	good	1	4	-	=6
22	2,3	95B	DC 850 470	good	1	-	-	=2
25	1,5	95B	EB 075 675	fair	-	-	1	=1
35	1,6	95E	XT 450 800	poor	-	-	3	=3
35	1,6	95E	XT 435 855	poor	-	-	1	=1
42	1	95E	XU 260 540	good	1	-	-	=2
43	1,5	95L	WU 890 765	good	-	-	1	=1
44	3	95L	WU 620 160	fair	1	3	-	=5
46	1,6	95L	VU 680 745	fair	1	-	-	=2
65	2,6	95O	DE 550 850	good	1	-	-	=2
66	2,3,6	95O	DE 510 995	good	1	-	-	=2
66	2,3,6	95O	DE 520 915	good	-	-	4	=4
67	1,3,6	95O	DE 550 220	good	1	-	-	=2
74	1,6	95K	DE 420 040	good	-	-	1	=1
75	1,6	95K	DD 685 915	good	-	-	1	=1
75	1,6	95K	DD 685 910	good	-	-	1	=1
76	1,6	95J	DE 760 145	fair	1	-	-	=2

*1=lake, 2=creek, 3=oxbow lake, 4=river, 5=pond, 6=pond complex.
**See Appendix 2.
***A=pairs, B=cygnets, C=singles and groups, D=total birds observed.

sedge meadow interspersed with alder (Alnus sp.) shrubs. The emergent vegetation consisted of cattail (Typha latifolia) bordered by an inner band of bog-rush (Juncus sp.) which graded into a zone of horsetail (Equisetum sp.). Horsetail covered extensive areas of the ponds. Waterlily (Nuphar variegatum) was the only obvious submergent species. The pair was attending four eggs on 28 May and were seen with three young on a nearby waterbody on 27 July. Only one young was present when the pair was seen again on 10 September (Heap 1985).

A pair, attending six eggs, was observed here in 1984 (McCormick 1985).

Area 10: This area was not occupied during our survey but a pair was observed on a small lake on 9 June, 1985 (Heap 1985). A pond complex is also associated with this lake. Sedge was the major vegetation type in the emergent zone while both pond weeds (Potamogeton sp.) and waterlily were observed within the lake and ponds.

Area 11: No birds were seen during our survey, but a pair was observed on a pond on June 9, 1985 (Heap 1985). The wetlands at this site consist of a creek and a complex of ponds. Both emergent and submergent vegetation was abundant and diverse. This site was noted as good habitat.

Area 14: A pair was observed in this area which includes a creek, oxbow lakes and ponds. Emergent vegetation included sedge (Carex sp.) and horsetail (Equisetum sp.) which was greater than 40 m wide in several locations.

There are no previous records from this area.

Area 18: Two non-breeding pairs and a pair with five cygnets were recorded in this area. The area includes a creek, ponds, and pond complexes. Sedge was common but usually less than 40 m wide. Numerous standing dead trees suggested that the area had been flooded, possibly by beavers. Six moulting birds were seen in this area in 1980 (Anon 1980).

Area 19: A pair with three young were recorded on Yohin Lake. This pair was incubating four eggs on 28 May, 1985 and were seen with two young, on 10 September (Heap 1985). Yohin Lake is shallow with a mosaic of open water, sedge islands, and extensive stands of emergent aquatics such as waterlily and horsetail. Bogrush and cattail predominate along the margins of the lake and larger islands. Northern arms of the lake consist of sink holes with minimal marginal vegetation.
Two pairs of adults and five cygnets were observed on Yohin Lake in 1984. Breeding has been recorded on this lake since 1977 (McCormick 1985).

Area 20: A group of four adults and a pair with four cygnets were observed in this area. The area is an extensive complex of ponds with shallow water. Reed grass, sedge, horsetail and lily pads were common. The width of the emergent vegetation zone was usually greater than 40 m. This is the first record for this area.

Area 21: A pair with three young were observed at this site. The ponds and oxbow lakes occupy an abandoned river channel. Extensive (greater than 40 m) stands of sedge were apparent on some of the ponds. This is the first record for this area.

Area 22: A non-breeding pair and a pair with four cygnets were recorded in this area which is similar to area 21. Probably the same pair was observed on the Netla River, with six young, on 2 July, 1985. Three adult birds were also observed near the Netla River on the same date (Heap 1985). The waterbodies occupy abandoned river channels; broad stands of sedge and horsetail were common.

There are no previous breeding records for this area although birds have been seen here previously (B. Kozachenko, Parks Canada, pers. comm.).

Area 25: A lone bird was observed in this area which includes Lake Bovie and a number of surrounding lakes and ponds. Reed grass, sedge, and horsetail were present but in minimal quantities.

A single bird was observed on Lake Bovie in 1977 (Quinlan 1978).

Area 35: A group of three birds and a lone bird were observed in this area which includes a group of small lakes with limited sedge margins. There are no previous records for this area. This area was rated as poor swan habitat.

Area 41: No birds were observed during our survey, however, one bird was seen here on 29 May and a pair was observed on 10 September, 1985 (Heap 1985). Irvine Creek is a slow-flowing, meandering stream with numerous oxbow lakes and adjacent ponds. Well developed margins of sedge occur on some of the larger waterbodies. This area was rated as good swan habitat.

A pair of swans was observed in this area in 1984 (McCormick 1985).

Area 42: Four birds were noted on the western lake in this area on 31 May, while a pair of birds were seen on the eastern lake on 23 July. A pair was also noted on the eastern lake on 14 August (Heap 1985). Both of the lakes appeared to be deep with narrow margins of diverse emergent vegetation. Pond weeds and lily pads were abundant and the area was rated as good habitat.

A pair of swans was defending a nest of six eggs on the western lake in June 1984 (McCormick 1985).

Area 43: A lone bird was observed in this area. A pair of swans were seen on 28 May 1985 on a pond across the river from Rabbitkettle Lake and a single bird was observed the next day on a pond at the western end of this area (Heap 1985). Many of the ponds in this area are sinkholes with limited emergent vegetation but a few have well developed margins of diverse emergent vegetation. The habitat ranges from poor to good, depending on the amount and diversity of emergent and submergent vegetation.

A pair and a lone bird were observed in this area within each pond in 1984 (McCormick 1985).

Area 44: A pair with three cygnets was observed in this area which consists of a complex of ponds on the South Nahanni River flood-plain. Extensive stands of reed grass, sedge, and horsetail were present. This is the first breeding record for this area although the birds have been known to local residents for some time (J. Jensen, pers. comm.).

Area 46: A pair of swans were recorded in this area which includes a lake and several ponds. Extensive stands of sedge were present. There are no previous records for this area of fair swan habitat.

Area 65: A pair of swans were observed in this area which includes a creek and numerous adjacent ponds and complexes. Extensive diverse, margins of emergent vegetation were present on many of the wetlands. There are no previous records for this area of good swan habitat.

Area 66: A pair and a group of four adults were recorded in this area which includes a creek with adjacent ponds and pond complexes. Good margins of reed grass and sedge were present. There are no previous records for this area. It was rated as good swan habitat.

Area 67: A pair of swans was noted on the western end of Carlson Lake. The area includes the lake and adjacent ponds. Sedge and horsetail were common around the ponds and portions of

the lake. There are no previous records for this area. Due to the lack of diversity in the aquatic vegetation and the variable width of the emergent zone, the area was rated as fair swan habitat.

Area 74: A lone bird was recorded on the unnamed lake in this area. Although the lake had limited sedge margins, the area was rated as good swan habitat. This is the first record for this area.

Area 75: Two lone birds were seen on separate ponds in this area. The ponds supported good stands of sedge and horsetail and were rated as good swan habitat. There are no previous records for this area.

Area 76: A pair of swans were noted in this area. This area is an extensive network of lakes, ponds, and pond complexes which occurs on the Mackenzie River floodplain. This area was rated as fair swan habitat. There are no previous records for this area.

4.2 Swan Distribution

With few exceptions, trumpeter swans were associated with wetlands which occurred on floodplains adjacent to rivers, creeks, or lakes (Fig. 3). Prevailing surficial materials in these areas include sand, silt, peat and organic silt (Anon. 1974). Such materials are conducive to the growth of emergent vegetation. The majority of the swans were observed below 1300 m agl, but individuals were also observed at approximately

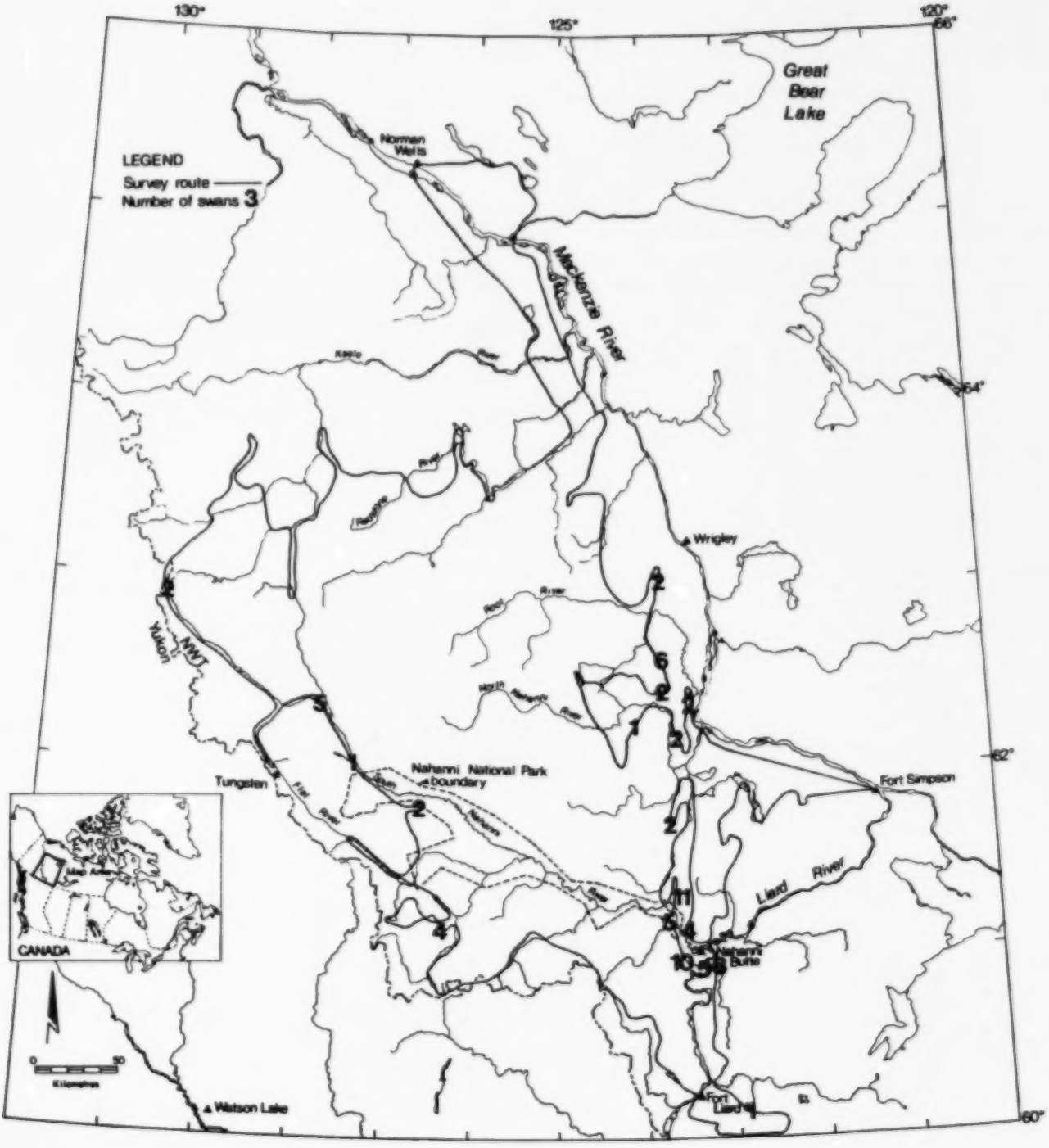

Figure 3. Distribution of trumpeter swans in south Mackenzie District, August 1985.

600 m agl (sites 43 and 44) and about 900 m agl (sites 35 and 46). The concentration of birds in the Nahanni Butte area is striking. Twenty-two adults and six broods (21 cygnets) occurred in this area. Breeding in the south Mackenzie District was first recorded at Yohin Lake in 1977 (L. Carbyn, CWS, pers. comm.) and it is unlikely that additional breeding sites in the vicinity would have gone unnoticed (McCormick 1985). It is likely that the present breeding population originated from the original breeding stock at Yohin Lake.

An additional fifteen adults were observed in the vicinity of Carlson Lake. In light of trumpeter swans' reluctance to pioneer it is conceivable that this is also a focus of breeding effort. Although no observations during this survey would confirm this interpretation, a group of four non-breeding adults is suggestive of a family group. Further surveys are required to confirm this hypothesis.

Reasons for the failure of birds to breed in Area 42 are not apparent. Although a clutch of five eggs was observed in 1984 (McCormick 1985) there was no evidence of attempted breeding in May 1985 (D. Eastcott, Parks Canada, pers. comm.).

A subjective evaluation (Appendix 2) of the areas which were surveyed suggests that there is a surplus of good trumpeter swan habitat in the Mackenzie District. It is anticipated that additional areas will be occupied as swan numbers increase.

4.3 Estimated Population

The majority of potential breeding areas (Fig. 2) in the southern Mackenzie District were examined during this survey. However, additional observations (Appendix 1) suggest that some swans were not recorded.

In deference to Parks Canada wishes, we did not survey the portion of the South Nahanni River valley which is within Nahanni National Park. This area, however, has produced 48% of the historical observations of swans in the region (McCormick 1985). A pair and a lone bird were observed in the area in 1984 (McCormick 1985). It seems reasonable to assume that a similar number of birds were present during this year.

Approximately 6-8 swans were observed on O'Grady Lake in early July 1985 (T. Grant, pers. comm.). Although the lake was not examined during this survey, aerial photographs suggest that the area is good swan habitat. Accordingly, it is assumed that six swans were present in this area.

Although 51 adult swans were recorded during this survey, it appears that additional birds were present in the region. In view of the above observations and the amount of suitable habitat which may not have been surveyed, an estimated minimum of 70 adult trumpeter swans were present in the southern Mackenzie District in August 1985.

This estimate must be considered in light of the above assumptions. It will be further refined as additional field work is completed. The fall 1985 Canadian population (Interior

Canada subpopulation) consists of about 600 birds. Therefore, the NWT population represents approximately 13% of the total Canadian population.

5.0 RECOMMENDATIONS

In light of the above discussion and the priorities of the North American Trumpeter Swan Management Plan (Anon. 1984) it is recommended that:

1) additional surveys be conducted and extended to confirm trumpeter swan distribution and abundance.
2) opportunities be explored with Parks Canada for the cooperative monitoring of trumpeter swans in the Nahanni Butte area.
3) a number of swans be collared to determine the migration route, wintering habitat, and population status of swans breeding in this region.
4) verify that all swans observed in the Mackenzie District are trumpeter swans.

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Appendix 1. Additional observations of trumpeter swans in southern Mackenzie District, summer 1985.

Date	UTM Location	Number Adults	Number Cygnets	Source
28 May	DC 709 741	2	4*	Heap (1985)
28 May	DC 590 865	2	4*	Heap (1985)
28 May	WU 947 728	3	-	Heap (1985)
29 May	WU 840 840	1	-	Heap (1985)
29 May	XU 218 420	1	-	Heap (1985)
29 May	DC 735 682	1	-	Heap (1985)
30 May	CD 869 154	2	-	Heap (1985)
31 May	XU 225 450	4	-	Heap (1985)
09 June	DC 780 985	2	-	Heap (1985)
09 June	DD 710 200	2	-	Heap (1985)
14 June	DC 164 944	4	-	Heap (1985)
26 June	DC 860 850	2	-	Heap (1985)
- July	VV 950 900	-	-	T.Grant, pers. comm.
- July	DC 875 740	2	6-8	C.Inghram, pers.comm.
02 July	DC 825 550	2	6	Heap (1985)
02 July	DC 890 550	3	-	Heap (1985)
03 July	XU 225 545	2	-	Heap (1985)
27 July	DC 683 776	2	3	Heap (1985)
14 August	XU 260 540	2	-	Heap (1985)
25 August	DC 925 715	3	-	C.Balsllie, pers. comm.
10 Sept.	DC 709 741	2	1	Heap (1985)
10 Sept.	DC 590 865	2	2	Heap (1985)
10 Sept.	XU 195 455	2	-	Heap (1985)

*eggs.

Appendix 2. Features of wetlands surveyed in southern Mackenzie District, August 1985.

Area No.	Map No.	Wetland[1] Type	Emergent[2] Vegetation	Submergent[3] Vegetation	Edge[4] Width	Turbidity[5]	Habitat[6] Rating
1	95G	1,6	4	1,2	1	1	2
2	95G	1,6	1,4	1	1	1	2
3	95G	1,2,6	4	1	1	1	2
4	95G	2,6	4	1	1	1	3
5	95G	1,2,6	4	1	1	1	3
6	95G	1	4	1	1	1	2
7	95G	1,6	4,3	1	2	1	2
8	95G	2,3,7	4,6	1	1	1	2
9	95G	3,6	3,4,5	1,2	1	1	1
10	95G	1,6	4	1,2	1,2	1	2
11	95G	2,6	2,3,4,5	1,2	1	1	1
12	95G	2,3,5,6	4	1	1	1	1
14	95G	2,3,6	2,4,5	1,2	1,2	1	1
15	95G	1,2	2,4,5	1,2	1	1	2
16	95G	1,2	2,4,5	1,2	1	1	1
17	95G	2,6	2,4,5	2	1	1	2
18	95G	2,6	2,4,5	1,2	1	1	1
19	95G	1	1,2,3,4,5	1,2	0	0	2
20	95B	1,6	1,2,3,4,5	1,2	2	0	1
21	95B	2,3	1,2,3,4,5	1,2	2	0	1
22	95B	2,3	1,2,3,5	1,2	1	1	1
23	95B	3,6,7	1,2	0	1	1	3
24	95B	1,5	4	1	1	1	3
25	95B	1,5	1,2,3,4	1,2	1	1	2
26	95B	1,5	4	1,2	1	1	3
27	95B	1,5	3,4	1,2	1	1	3
28	95B	1	2,3,4,5	1,2	1	1	3
29	95B	1,2,3	2,3,4,5,6	1,2	1,2	1	1
30	95F	1	-	4	1	1	3
31	95C	1,6	2,4	1,2	1	1	3
32	95D	1,2,6	2,4,5	1,2	1,2	1	2
33	95D	2,6	2,4	1,2	1,2	0	2
34	95E	1,6	2,4	1,2	1,2	0	2
35	95E	1,6	2,4	1,2	1	1	3
36	95E	1	-	4	1	1	3
37	95E	1,6	4	2	0,1	0	3
38	95E	1	4	1,2	1	1	3
39	95E	1,6	4	0	0	0	3
40	95E	3,4,6	2,3,4,5	1,2	1	0	2
41	95E	2,3,6	4	1,2	1	1	1
42	95E	1	2,3,4,5	1,2	1	0	1
43	95L	1,5	2,3,4,5	1,2	1	0	1
44	95L	3,6	2,3,4,5	1,2	1,2	1	2

Appendix 2. Continued.

Site No.	Map No.	Wetland[1] Type	Emergent[2] Vegetation	Submergent[3] Vegetation	Edge[4] Width	Turbidity[5]	Habitat[6] Rating
45	95L	1,6	4	1,2	1	0	3
46	95L	1,6	2,4,6	1,2	1,2	0	2
47	105P	6	2,4,6	0	0	0	3
48	105P	1	2,4,6	0	1,2	0	3
49	105P	1	0	0	0	0	3
50	105P	5	4,6	0	0	0	3
51	105P	1,6	2,4,6	2	1	0	3
52	105P	6	2,4,6	0	0	0	3
53	95M	6	2,4,6	2	1	0	3
54	95M	1	4	0	0	0	3
55	95M	1,3,4,6	2,4	1,2	1	1	3
56	95N	1,6	2,4	1,2	1	0	3
57	95N	1,6	2,4,5	1,2	1	1,2	3
58	95N	6	2,3,4,5	1,2	1,2	1	2
59	95N	1,4,5,7	2,4,5	1,2	1,2	1	2
60	95N	1	2,4,5,6	2	1	1	3
61	95N	2,5,6,7	2,4	1,2	1	1	2
62	95N	2,6,7	2,3,4,5,6	1,2	1,2	1	1
63	95K	5,6	1	4	0,1	2	2
64	95K	1,6,7	2,4	1,2	1,2	1	3
65	95O	2,6	2,3,4,5,6	1,2	1,2	1	1
66	95O	2,3,6	2,4,5,6	1,2	1,2	1	1
67	95O	1,3,6	4,5	1	0,1	1	2
68	95K	2,6	2,4,5	1,2	1,2	1	1
69	95K	1,6	2,4	1,2	1,2	1	3
70	95K	1	4	1	1	1	3
71	95K	1	4	0	0	1	3
72	95K	1,6	2,4	1,2	1	1	2
73	95K	1,6,7	2,4	1,2	1	1	2
74	95K	1,6	2,4	1,2	1,2	1	3
75	95K	1,6	2,4,5	1,2	1,2	1	1
76	95J	1,6	2,4	1,2	1,2	1	2
77	95J	6	2,4	1,2	1	1	2

[1] 1=lake, 2=creek, 3=oxbow lake, 4=river, 5=pond, 6=pond complex, 7=muskeg
[2] 0=none, 1=cattail, 2=reedgrass, 3=bulrush, 4=sedge, 5=horsetail, 6=willows
[3] 0=none, 1=lilypads, 2=pondweeds
[4] 0=none, 1=<40 m, 2=>40 m
[5] 0=clear, 1=medium, 2=turbid
[6] 1=good, 2=fair, 3=poor